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Lung Functions Assessment Using Impulse Oscillometry (IOS) in Severe Asthmatic Adolescents During the Asymptomatic Period: A Preliminary Study

Jayarathna RMPI¹, Nayakarathne NMDGB¹, Chandrasiri WAPN¹, Perera NADS¹, Ananda SDWK¹, Nuwangi H², Rajapakse RMSI^{3,4}

¹*Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka*

²*Center for Health Services Studies, University of Kent, Giles Ln, Canterbury CT2 7NZ*

³*Department of Public Health & AI, Graduate School of Cancer Science and Policy, National Cancer Center, South Korea*

⁴*Department of Physiology, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka*

Background: Impulse Oscillometry (IOS) is a lung function test that measures airway mechanics during quiet breathing offering an alternative to spirometry for diagnosing asthma. Asthma is a heterogeneous disease characterized by chronic airway inflammation and airflow obstruction.

Objective: To assess the lung functions of 13-14 years old adolescents with severe asthma, who were asymptomatic for one-month, from Anuradhapura, Sri Lanka.

Methods: A preliminary study was conducted in a simple random sample of 15 adolescents attending government schools aged 13-14 years with severe asthma but were asymptomatic for one month duration. Severe asthma was detected using the validated International Study of Asthma and Allergies in Children questionnaire. Bronchodilators (short-acting: 4h, long-acting: 24h) were withheld before performing IOS. IOS was performed per European Respiratory Society and American Thoracic Society guidelines. The reactance(X) and resistance(R) were measured at frequencies 5 to 20 Hz (R_5 , R_{10} , R_{20} , X_5). R_5 measures total airway resistance. R_{10} marks central-peripheral airway transition. R_{20} measures central airway resistance. R_5 - R_{20} represents peripheral airway resistance. Resonance frequency (F_{res}) is the frequency at which the X is zero. The standard cut-off of 150% of the predicted values for R, $-0.15 \text{ kPa s L}^{-1}$ for X, and 150% cut-off for F_{res} were considered.

Results: The study sample consisted of 8 males and 7 females. Their BMI ranged from 12 to 23 kgm^{-2} . Two participants exhibited signs of airway obstruction. One participant showed reduced X_5 ($< -15 \text{ kPa.s.L}^{-1}$) and elevated R_5 - R_{20} ($0.38 \text{ kPa.s.L}^{-1}$) indicating peripheral airway obstruction. Other participant had a high F_{res} of 168.0% of the predicted suggestive of airway disease, but with a normal R_5 - R_{20} ($0.11 \text{ kPa.s.L}^{-1}$) and normal X_5 ($-0.09 \text{ kPa.s.L}^{-1}$). Therefore, the participant had evidence of airway disease that could not be differentiated with the current test.

Conclusion: IOS identified airway dysfunction in 2 participants even during an asymptomatic period.

Keywords: Adolescents, Asthma, Lung functions